WHY SCIENCE LOVES MATHEMATICS?

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Mathematics is the language of science and the foundation of STEM education. The interdisciplinary link between science and mathematics develops problem-solving, computational thinking, and strategic analysis skills. Activities like path and matchstick puzzles support these skills, while different physics principles and mathematical relationships help appreciate the important roles scientific concepts play in understanding phenomena in nature and technology. This integration, enriched by artificial intelligence today, prepares students for the future as well-equipped individuals who can produce scientific solutions to real-world problems.

Mathematics is the language of all sciences and the backbone of science education. Science, technology, and engineering are inseparable from mathematics. While humans express themselves through words, drawings, and body language, science expresses itself through numbers, formulas, graphs, and geometric shapes. Therefore, mathematical skills and scientific process skills are intertwined. Problem-solving, computational thinking, logical reasoning, and algebraic thinking form the basis of these skills. Mathematics provides a necessary language and tool for describing, understanding, modeling, and predicting natural phenomena. In disciplines such as physics, chemistry, biology, and engineering, it enables students to interpret data, recognize patterns, and develop logical problem-solving skills (Palmgren et all, 2025). Thus, the integration of mathematics in science classrooms deepens not only numerical skills but also conceptual understanding.

The use of mathematics in science education helps connect abstract concepts with real-world applications. For example, algebra and calculus are indispensable for calculating motion and energy in physics classes; and statistics are essential for analyzing experimental data in biology. This approach builds a strong foundation in STEM fields by developing students' interdisciplinary thinking skills. STEM offers an understanding that integrates disciplines to solve real-world problems throughout the educational process, from K-12 to university. It is becoming increasingly important for students to be able to perform strategic analysis, think critically and creatively, and solve problems using three-dimensional and spatial intelligence. With technological advancements, problem-solving activities such as path puzzles and matchstick puzzles also contribute to the development of these skills.

Path puzzles are important for algebraic thinking, and matchstick puzzles are important for cognitive and computational thinking. Path puzzles and matchstick puzzles are fun activities that develop students' problem-solving and logical thinking skills. Path puzzles require finding the correct route between starting and finishing points according to specific rules. Matchstick puzzles are solved by rearranging geometric shapes (Slisko, 2025; Danesi, 2026; Slisko, 2026). Both activities play an important role in science education by supporting computational thinking, spatial intelligence, creativity, and strategic planning.

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Mathematics enhances scientific literacy, preparing individuals to address global challenges such as climate change, health, economics, engineering, and technology. Inquiry-based learning, visualization, and the use of digital tools make mathematical concepts more accessible. Thus, science education serves not only academic achievement but also the development of scientifically minded individuals capable of finding solutions to societal problems. Strategic analysis and solution planning are critically important, especially in the healthcare field. For example, determining the correct treatment method and administering the appropriate dose of medication for a patient arriving at the emergency room requires strategic thinking skills.

In one K–12 STEM education project (SILT), a team of university scientists engaged two middle school student groups in testing innovative environmental research technologies to measure sediment flowing underneath river ice (Clement et al., 2024). Furthermore, sea and air transportation vehicles, which we frequently use for travel, exemplify the collaboration of multiple scientific disciplines and the relationship of the STEM approach with real life. Finding scientific understanding of real-life phenomena isn't a simple process and is prone to conceptual mistakes. A good example is the popular "explanation" of aerodynamic lift based on Bernoulli's Principle, found in many physics textbooks: The wing is pushed upward as the air above the wing moves faster, creating low pressure, while the air below the wing moves more slowly, creating high pressure. The conceptual error is a "logical" supposition that air must flow above and below the wing, spending the same amount of time. Fortunately, the presence of critical thinking in the scientific community helped in finding better explanations of aerodynamic lift (Silva & Soares, 2010; McLean, 2018; Šlégrová & Šlégr, 2022).

Fibonacci's sequence is a mathematical pattern that connects, in an unexpected way, flower buds, cones, snail shells, sunflowers, calla lilies, the placement of the chin, nose, and eyebrows in facial aesthetics, and spider webs. In fact, mathematics and geometry have revealed what already exists in the universe, helping humans to comprehend it. We can observe Fibonacci's Golden Ratio not only in nature but also in magnificent man-made masterpieces such as the Mona Lisa, the Egyptian pyramids, and contemporary architectural works.

The STEM concept has been widely used and has taken its place in the literature since the early 2000s (Bryan & Guzey, 2020; Gavrilas & Kotsis, 2025; Samara & Kotsis, 2025). Although the STEM concept has been expanded to STEAM by adding ART, there is, in fact, an unnamed relationship between historical periods and the concept (Masalimova et al., 2025 & Lazarinis, 2025). From this perspective, one of the most recently published studies on the STEAM concept, titled 'The Interactive Design Process Framework (IDPF): Utilizing GenAI as a Collaborative Agent for Creating STEAM Projects,' has an unspoken connection with past work. Today's reality of AI has revealed the partnership between IDPF and STEAM (Sotiropoulos et al., 20026).

This demonstrates how valuable the skills acquired through science education in K–12 are in real life. Consequently, science and mathematics are complementary epistemological fields. While science observes and explains nature, mathematics represents these observations through formal models and equations. This reciprocal relationship forms an indispensable foundation for producing scientific knowledge and solving real-world problems.

References

Bryan, L., & Guzey, S. S. (2020). K-12 STEM education: An overview of perspectives and considerations. *Hellenic Journal of STEM Education*, *1*(1), 5–15. https://doi.org/10.51724/hjstemed.v1i1.5

Clement, S., Spellman, K., Eidam, E., Langhorst, T., Arp, C., Davis, J., Pavelsky, T., & Bondurant, A. (2024). How do you sample a frozen river? Increasing K–12 STEM engagement through real-world problem solving and scientific research. *Connected Science Learning, 6*(2), 66–76. https://doi.org/10.1080/24758779.2024.2328225

Danesi, M. (2026). Matchstick mathematics: On Josip Slisko's *Fostering cognitive mathematics skills with matchstick puzzles*. *European Journal of Science and Mathematics Education, 14*(2), 162–170. https://doi.org/10.30935/scimath/17899

Gavrilas, L., & Kotsis, K. T. (2025). Integrating learning theories and innovative pedagogies in STEM education: A comprehensive review. *Eurasian Journal of Science and Environmental Education, 5*(1), 11–17. https://doi.org/10.30935/ejsee/16538

Haigh, J. (2019). *Mathematics in everyday life*. Latest edition Springer. https://doi.org/10.1007/978-3-030-33087-3

Lazarinis, F. (2025). An approach for developing inclusive and engaging pedagogical content connected to physical objects for STEAM education. *Contemporary Mathematics and Science Education, 6*(2), Article ep25011. https://doi.org/10.30935/conmaths/16438

Masalimova, A. R., Zheltukhina, M. R., Sergeeva, O. V., Sokolova, N. L., Sizova, Z. M., & Kochneva, L. V. (2025). Mobile instant messaging applications in STEAM education: Scoping review. *Online Journal of Communication and Media Technologies, 15*(4), Article e202534. https://doi.org/10.30935/ojcmt/17425

McLean, D. (2018). Aerodynamic lift, part 1: The science. *The Physics Teacher*, *56*(8), 516–520. https://doi.org/10.1119/1.5064558

Palmgren, E., Kokkonen, T., & Bruun, J. (2025). Roles of mathematics in physics education: A systematic review. *Physical Review Physics Education Research*, *21*(2), Article 020602. https://doi.org/10.1103/wwww-gwp8

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ISSN 2538–7138 /Online/

Samara, V., & Kotsis, K. T. (2025). Pedagogical approaches and materials used by kindergarten and elementary school teachers in Greece to implement STEM education. *International Journal of Professional Development, Learners and Learning, 7*(2), Article e2519. https://doi.org/10.30935/ijpdll/17620

Silva, J., & Soares, A. A. (2010). Understanding wing lift. *Physics Education*, *45*(3), 249–252. https://doi.org/10.1088/0031-9120/45/3/004

Šlégrová, L., & Šlégr, J. (2022). Simple apparatus for demonstrating factors that influence lift and drag. *American Journal of Physics*, *90*(5), 359–364. https://doi.org/10.1119/10.000968

Slisko, J. (2025). Helping puzzle-solvers find solutions missed by a famous puzzle author: Initial study on stimulated creativity. *European Journal of Science and Mathematics Education, 13*(4), 385–394. https://doi.org/10.30935/scimath/17509

Slisko, J. (2026). *Fostering cognitive mathematics skills with matchstick puzzles: A guide for researchers, teachers, and general readers*. Springer. https://doi.org/10.1007/978-3-032-14561-1

Sotiropoulos, D., Xenakis, A., Kalogiannakis, M., & Taşar, M. F. (2026). The Interactive Design Process Framework (IDPF): Utilizing GenAI as a collaborative agent for creating STEAM projects. *Hellenic Journal of STEM Education*, *5*(1), 1–18. https://doi.org/10.51724/hjstemed.v5i1.76

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